

National Marine Fisheries Service  
Southwest Fisheries Science Center  
Santa Cruz Laboratory  
110 Shaffer Road  
Santa Cruz, California 95060

January 31, 2005 F/SWC3:KAB

**CRUISE ANNOUNCEMENT**

**VESSEL:** NOAA R/V DAVID STARR JORDAN

**CRUISE DATES:** MAY 1 - JUNE 12, 2005

**PROJECT:** DS-05-04 ~ Rockfish Recruitment Assessment,  
NOAA - NMFS - SWFSC, Santa Cruz Laboratory  
Groundfish Analysis Team, Santa Cruz, CA

**ITINERARY:** LEG 1: May 1 - May 7  
Depart MARFAC San Diego the morning of May 1.  
Conduct night-time mid-water trawling and day-time CTD operations from the San Diego transect through the Piedras Blancas transect in a south to north direction.

LEG 2: May 7 - May 14  
Exchange scientists via skiff on the morning of May 7, at Santa Cruz Harbor. Conduct night-time mid-water trawling and day-time CTD operations from the Monterey Bay Inside transect through the Pt. Reyes transect in a South to North direction.

LEG 3: May 14 - May 22  
Exchange scientists via skiff on the morning of May 14, at Bodega Bay. Conduct night-time mid-water trawling and day-time CTD operations from the Fort Ross transect through the Delgada transect in a South to North direction, then duplicate the operations from the Delgada transect through the Outside Farallon Islands transect in a North to South direction. On May 22, arrive in port at San Francisco upon the completion of Leg 3. Two days will be spent in port at a San Francisco Pier on May 23 and May 24. Inport Pier TBD.

**LEG 4: May 25 - June 1**

Embark scientists on the morning of May 25 and depart San Francisco to begin Leg 4. Conduct night-time mid-water trawling and day-time CTD operations from the Gulf of the Farallones transect through the Monterey Bay Inside transect in a North to South direction, then conduct krill acoustic surveys with ground-truthing Tucker Trawls during daylight hours and trawl codend liner mensurations during the night time for the remainder of Leg 4.

**LEG 5: June 1 - June 7**

Exchange scientists via skiff on the morning of June 1, at Santa Cruz Harbor. Conduct night-time mid-water trawling and day-time CTD operations from the Piedras Blancas transect through the San Diego transect in a North to South direction.

**LEG 6: June 7 - June 12**

Transit north to Monterey and conduct night-time mid-water trawling and day-time CTD operations from the Monterey Bay Outside transect through the Outside Farallon Islands transect in a south to north direction. On June 12, arrive in San Francisco (Pier TBD) to end DS-05-04.

**SUMMARY OF OBJECTIVES:**

1. To determine the distribution and abundance of pelagic-juvenile, rockfish between San Diego and Delgada, CA and their relationship with oceanographic conditions.
2. To characterize prominent oceanographic features.
3. To map the distribution and abundance of krill along the continental shelf and shelf break.
4. To observe seabird and marine mammal distribution and abundance.
5. To collect adult groundfish.

**METHODS :**

1. Juvenile Rockfish Survey: 36 transects of night-time mid-water trawls are planned during the cruise. Five to seven midwater trawls of 15 minute duration will be conducted each night along each transect. A modified-Cobb midwater trawl with an 86' headrope and a 3/8" codend liner will be used to catch juvenile rockfish. Ship speed will be maintained at approximately 2.0 knots while trawling. Ship's speed will be adjusted during tows to achieve a headrope depth of 30 meters for the vast majority of tows. Trawling operations will commence just after dusk and conclude just before dawn. Target headrope depths are 7, 30, and 100 meters. We will start with 25, 85, and 215 meters of wire out, with adjustments made if target depths are not obtained, as determined from depth recordings collected from a VemCo TDR and the SIMRAD ITI acoustic trawl net monitoring system. The ITI and TDR sensors will be attached to the net during each tow. Fish and certain invertebrates from each trawl will be sorted, identified and enumerated. Juvenile rockfish and any salmon will be frozen for laboratory analyses.

CTD casts using the port J-frame will be conducted throughout the day in the vicinity of the trawl transects and at each trawl station at night. The scientific party may exclude some CTD casts during daytime and/or night-time operations in the interests of the time needed to complete planned mid-water trawls. A Seabird Electronics Seacat CTD will be used in conjunction with a Seabird Electronics Model 32/33 Carousel Water Sampling System. The CTD will be lowered to a maximum depth of 520 m, as bottom depth allows. Deployment rate: soak for 2 minutes at 10 meters depth, then beginning at the surface - 45 m/min on the downcast, and 60 m/min for the upcast. Water samples will be taken three times per day for chlorophyll and nutrient samples. Water samples will be collected during the upcast with Niskin Bottles attached to the Seabird carousel.

2. Survey of Prominent Biological and Physical Oceanographic Features. The Simrad EK500 echosounder will be used to acoustically characterize the distribution and abundance of macro-zooplankton and micro-nekton, meroplankton and zooplankton associated at prominent oceanographic features and locations. Choice of sites will depend on logistics and weather. Net sampling with the 1 m<sup>2</sup> Tucker trawl or midwater

trawl, will be used to verify the identity of acoustic targets. Oceanographic data will be collected with the CTD, a Turner Designs SCUFA fluorometer, thermosalinometer and an RDI Acoustic Doppler Current Profiler.

3. A series of daytime transects will be run, during which the Simrad EK500 echosounder will be used to record and geo-reference the presence and abundance of krill. Target identification will be periodically accomplished by setting Tucker trawl gear on areas of heavy backscatter.

4. Ornithologists and marine mammal biologists will visually survey and estimate abundance of seabirds and marine mammals from the Ship's flying bridge during daylight hours while underway.

5. Hook and line fishing will be conducted in the southern California bight in order to collect genetic samples of adult rockfish of the subgenus *Sebastomus* (includes *Sebastes chlorostictus*, *S. constellatus*, *S. ensifer*, *S. eos*, *S. helvomaculatus*, *S. lentiginosus*, *S. rosaceus*, *S. rosenblatti*, *S. simulator*, and *S. umbrosus*). A fingernail size tissue sample will be removed from the caudal fin and saved on blotter paper and stored in sample envelopes. In addition, each fish will be frozen and brought back to the Santa Cruz Laboratory for ID confirmation. As a secondary goal, tissue samples should also be saved from any other rockfish species collected in which the adult IDs can readily be confirmed.

Hook and line fishing will be conducted at various locations during the cruise. to obtain samples of adult rockfish of as many species as possible to supplement the Santa Cruz Lab's groundfish ecology cruise program. Scientists and crew will use standard sportfishing gear to obtain samples of fish. The fish will be weighed, measured, sexed, ovaries collected, and otoliths removed. After sampling, the fish will be turned over to the vessel. Locations of the fishing activity will be determined by current location of the vessel, available time, and operational constraints. Areas of specific interest include: Davenport, Cordell Bank, Fanny Shoals, and Natural Bridges area off Santa Cruz. The Santa Cruz Lab will provide tackle and some fishing poles as well as bait and all processing equipment.

Nearshore flatfish sampling is proposed for any days and nights in which the Ship cannot perform normal operations (i.e.

weather days). Sampling will specifically target starry flounder and sand sole. The main location for sampling will be Drakes Bay, although samples from inside Monterey Bay will be valid. Fishing equipment to be used will likely be a drifting longline. The longline will be deployed from a large fishing reel. The longline will consist of 200 lb. test monofilament, with up to 50 hooks spaced 5' apart with a 3 lb. weight at the terminal end of the line. The hooks will be baited with squid. The gear will be deployed while drifting or slowly making way (.5 knots SOG). Fishing will be in water depths from 20 - 40 meters (10-20 fathoms). Each drift will last for approximately one hour. The gear will be retrieved and starry flounder and sand sole will be processed. All other species including California halibut and bat rays will be measured and released. Any halibut caught which does not survive, will be turned over to the Ship. The Santa Cruz Laboratory will provide all required fishing gear and bait.

**MISCELLANEOUS REQUIREMENTS:**

The Chief Scientist is authorized to alter the scientific portion of this cruise plan with the concurrence of the Commanding Officer, provided that the proposed changes will not: (1) jeopardize the safety of personnel or the ship; (2) exceed the time allotted for the cruise; (3) result in undue additional expense; or (4) change the general intent of the cruise.

In accordance with NC Instruction 6280B, the Chief Scientist will provide an inventory of all hazardous material.

The Chief Scientist will provide medical forms for all cruise participants as soon as practicable and no less than two weeks prior to departure. NOAA Fleet Mediacial Policy requires that all scientific personellk embarking on NOAA vessels complete an SF-93 form, Report of Medical History.

Prior to departure, the Chief Scientist must provide a listing of emergency contacts to the Executive Officer for all members of the scientific party.

Upon embarkation of the scientific party, the Chief Scientist will provide the Ship with a field operations manual for mid-water trawling operations.

A pre-cruise meeting between the Scientific Party Leaders, the Ship will be held prior to commencement of operations to identify operational and logistic requirements.

A post-cruise meeting will be held between the scientific party and the Commanding Officer and the Department Heads of the Ship at the termination of the cruise.

A Ship Operations Evaluation Report will be submitted the the Marine Operations Center, within 30 days of the cruise completion.

***Recreational fishing:*** To participate in recreational fishing during the cruise, a valid CA recreational fishing license must be possessed and regulations pertaining to method of capture, as well as size and bag limits must be followed. It is illegal to sell or barter any fish caught during the cruise.

***Fish collected during research operations:*** No fish or invertebrates taken during scientific research aboard NOAA vessels may be sold, or bartered although consumption of captured fish and/or invertebrates aboard the vessel is allowed. For adult groundfish captured for research, personnel will be allowed to keep the fish after processing of the fish is complete. A fishing licence is required if the crewmember or scientist wishes to keep their scientifically captured fish/invertebrates after processing is complete.

#### **PARTICIPATING ORGANIZATIONS (Tentative):**

NOAA NMFS SWFSC Santa Cruz Laboratory  
University of California Santa Cruz (UCSC)  
JIMO - University of California San Diego  
San Francisco State University, Romberg Center for Env. Studies  
PRBO Conservation Science(formerly Point Reyes Bird Observatory)  
Oregon State University  
California Department of Fish and Game

**EQUIPMENT:**

***Supplied by R/V David Starr Jordan:***

Trawl Winches (5/8")  
Net Reel  
5x7' Steel V-doors, Mounted  
1/2" x 30 fathom, V-Shaped Midwater Trawl Bridles  
Modified-Cobb Mid-Water Trawl Net (1 complete net)  
Cowbells for securing codend of trawl nets  
Port J-frame and winch with 0.322 wire for CTD  
Starboard hydrographic winch (1/4" cable)  
Scientific Computer System and Electronic MOA  
Simrad ES60 depth recorder  
RDI Acoustic Doppler Current Profiler Interfaced with PC  
Thermosalinometer Interfaced with SCS  
Freezer space for seawater and chlorophyll samples  
Inclinometer  
EK500 Echosounder Interfaced with PC  
SIMRAD ITI Net Sounder System  
Antenna and Internal Hook-Up for Cellular Telephone  
Skiff

***Supplied by NMFS SWFSC La Jolla Lab:***

-85°F Freezer for fish and Invertebrate Samples  
CalCOFI Formalin Setup  
Flying Bridge Captain Chairs for Ornithologists

***Supplied by NMFS SWFSC Santa Cruz Lab:***

Modified-Cobb Mid-Water Trawl Nets (2)  
Tucker Trawl Frame, Weights, Plankton Nets, and Codends  
Specimen Sorting, Enumeration, and Preservation Equipment  
General Oceanic Flowmeters and Downrigger for Flowmeters  
Seabird SBE32 Carousel with SBE33 Deck Unit  
Seabird SBE19 and SBE19+ CTDs and CTD Toolbox  
Vemco TDRs  
Turner Designs 10 AU Fluorometer  
Turner Designs SCUFA Fluorometer and PAR Sensor  
Bench Salinometer  
Bucket Thermometer and Plastic 5 Gallon Buckets  
Seawater/Chlorophyll Sample Filtering Equipment  
PC Computers and LAN hubs  
Microscopes and Dissecting Equipment  
Fish and Invertebrate Identification Guides  
Fishing Tackle, Bait, and Adult Groundfish Processing Gear  
Ethanol (100%)  
Juvenile Rockfish Survey Toolboxes  
Mustang Float Coats and Foul Weather Clothes for the Scientists

**SCIENTIFIC PERSONNEL (Tentative):**

**Leg 1 (May 1 - May 7)**

Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA  
Keith Sakuma, Fish Biologist, NMFS-Santa Cruz, CA  
Don Pearson, Fish Biologist, NMFS-Santa Cruz, CA  
Fish Biologist or Volunteer - TBD  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Ornithologist - TBD  
Ornithologist - TBD

**Leg 2 (May 7 - May 14)**

Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA  
Keith Sakuma, Fish Biologist, NMFS-Santa Cruz, CA  
Don Pearson, Fish Biologist, NMFS-Santa Cruz, CA  
Fish Biologist or Volunteer - TBD  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Ornithologist - TBD  
Ornithologist - TBD

**Leg 3 (May 14 - May 22)**

Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA  
Keith Sakuma, Fish Biologist, NMFS-Santa Cruz, CA  
Don Pearson, Fish Biologist, NMFS-Santa Cruz, CA  
Fish Biologist or Volunteer - TBD  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Ornithologist - TBD  
Ornithologist - TBD

**Leg 4 (May 25 - June 1)**

Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA  
Keith Sakuma, Fish Biologist, NMFS-Santa Cruz, CA  
Don Pearson, Fish Biologist, NMFS-Santa Cruz, CA  
Fish Biologist or Volunteer - TBD  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Ornithologist - TBD  
Ornithologist - TBD

**Leg 5 (June 1 - June 7)**

Stephen Ralston, Fish Biologist, NMFS-Santa Cruz, CA  
Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA  
Keith Sakuma, Fish Biologist, NMFS-Santa Cruz, CA  
Don Pearson, Fish Biologist, NMFS-Santa Cruz, CA  
Fish Biologist or Volunteer - TBD  
Fish Biologist or Volunteer - TBD  
Fish Biologist or Volunteer - TBD  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Ornithologist - TBD  
Ornithologist - TBD

**Leg 6 (June 7 - June 12)**

Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA  
Keith Sakuma, Fish Biologist, NMFS-Santa Cruz, CA  
Fish Biologist or Volunteer - TBD  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Krill Specialist, UC Santa Cruz, Santa Cruz, CA  
Ornithologist - TBD  
Ornithologist - TBD

**SCIENTISTS DUTY HOURS:**

Night Trawl 1800-0600  
Day CTD 0600-1800  
Ornithologists Daylight Hours While Making Way  
Day Tucker Trawl TBD

The Ship will provide an experienced master fisherman, one Deck crewmember, and one winch operator, from dusk to dawn for mid-water trawling operations. One winch operator will be needed during daylight hours to operate either the port or starboard winches for CTD casts and/or Tucker Trawls.

**BERTHING:**

The Chief Scientist or his representative will submit a berthing plan for the scientific complement prior to the cruise and will work with the Field Operations Officer on any changes needed during the cruise. Berthing for scientists will be in the following staterooms. Stateroom M-3 will not be used, if at all possible:

Chief Scientist Stateroom (one bunk)  
01-1 Stateroom (two bunks)  
01-3 Stateroom (two bunks)  
01-5 Stateroom (two bunks)  
01-7 Stateroom (two bunks)  
M-1 Stateroom (two bunks)  
M-3 Stateroom (one bunk)

**SPECIMEN & DATA REQUESTS:**

Every effort will be made to fulfill requests for specimens and data. However, if the request is too large we may require the requestor to provide a person to collect the samples and/or data. Please provide your requests at the earliest possible date to the Groundfish Analysis Team of the NOAA NMFS Santa Cruz Laboratory, phone # (831)420-3945 or (831)420-3943.

**STAGING PLAN:**

Equipment and gear from the Santa Cruz Laboratory and from piggyback projects will be shipped to the DAVID STARR JORDAN in late April. The day before departure, scientists participating in Leg 1 of the cruise will fly to San Diego and embark the Ship, in order to setup the scientific equipment in the Laboratory spaces and on the weather decks.

**DE-STAGING PLAN:**

Upon arrival to San Francisco, on June 12, the scientists will package up and off-load the scientific equipment. The scientist will begin the off-load at a time to allow for a reasonable amount of rest from the previous night's operations. Scientific equipment which is off-loaded will be transported back to the Santa Cruz Laboratory via trucks.

**SMALL BOAT OPERATIONS:**

A skiff will be needed to embark/disembark scientists and miscellaneous gear at the conclusion/beginning of the different Legs. Exchanges may occur at the following locations; Morro Bay, Monterey Harbor, Santa Cruz Harbor, Pillar Point Harbor at Half Moon Bay, San Francisco Piers, Horseshoe Cove at Sausalito, Drake's Bay Pier, Bodega Bay Harbor. Exchange locations will depend upon operational status and/or location adjustments due to weather.

## JUVENILE ROCKFISH MIDWATER TRAWL AND CTD STATIONS

DAY: CTD - SAN DIEGO

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	32° 42.5'	117° 27'	580	520	4061
CTD	32° 47.9'	117° 37'	1020	520	4062
CTD	32° 54.4'	117° 46.7'	1040	520	4063
CTD	33° 06'	117° 52'	382	365	4064
CTD	33° 08'	117° 42'	810	520	4065
CTD	33° 02'	117° 32.3'	700	520	4066
CTD	32° 54.4'	117° 23'	550	520	4067

NIGHT: TRAWL & CTD - SAN DIEGO

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	33E 01'	117E 45'	750	520	481
trawl	33E 01'	117E 45'	750	85	481
trawl	32E 55'	117E 35'	850	85	482
CTD	32E 55'	117E 35'	850	520	482
CTD	32E 49'	117E 25'	700	520	483
trawl	32E 49'	117E 25'	700	85	483
trawl	32E 42.5'	117E 20'	100	85	484
CTD	32E 42.5'	117E 20'	100	90	484

DAY: CTD - SAN CLEMENTE

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	32° 43'	117° 57'	600	520	4071
CTD	32° 33'	117° 57'	963	520	4072
CTD	32° 33'	118° 09'	1900	520	4073
CTD	32° 33'	118° 21'	1385	520	4074
CTD	32° 33'	118° 33'	1111	520	4075
CTD	32° 33'	118° 45'	714	520	4076
CTD	32° 33'	118° 57'	1203	520	4077

NIGHT: TRAWL & CTD - SAN CLEMENTE

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	32E 43'	118E 09'	1000	520	401
trawl	32E 43'	118E 09'	1000	85	401
trawl	32E 43'	118E 27'	270	85	402
CTD	32E 43'	118E 27'	270	260	402
CTD	32E 43'	118E 44'	1284	520	403
trawl	32E 43'	118E 44'	1284	85	403
trawl	32E 43'	119E 03'	500	85	404
CTD	32E 43'	119E 03'	500	490	404

## DAY: CTD - SAN NICHOLAS

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	33° 31.29'	119° 15.4'	985	520	4001
CTD	33° 24.34'	119° 24.2'	963	520	4002
CTD	33° 20.2'	119° 32.5'	85	75	4003
CTD	33° 12.62'	119° 44.25'	460	450	4004
CTD	33° 26.54'	120° 01.55'	976	520	4005
CTD	33° 32.5'	119° 51.37'	330	320	4006
CTD	33° 37.75'	119° 41.63'	1366	520	4007
CTD	33° 44.55'	119° 32.46'	1930	520	4008

## NIGHT: TRAWL &amp; CTD - SAN NICHOLAS

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	33E 41.4'	119E 17.2'	886	520	411
trawl	33E 41.4'	119E 17.2'	886	85	411
trawl	33E 35.2'	119E 26.9'	1874	85	412
CTD	33E 35.2'	119E 26.9'	1874	520	412
CTD	33E 29.2'	119E 36.3'	769	520	413
trawl	33E 29.2'	119E 36.3'	769	85	413
trawl	33E 23'	119E 45.8'	107	85	414
CTD	33E 23'	119E 45.8'	107	97	414
trawl	33E 17.1'	119E 55.5'	956	85	415
CTD	33E 17.1'	119E 55.5'	956	520	415

## DAY: CTD - SAN MIGUEL

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	33E 57.4'	120E 25.5'	165	155	4009
CTD	33E 49.28'	120E 33.1'	1819	520	4010
CTD	34E 01.77'	120E 51.57'	948	520	4011
CTD	34E 09.75'	120E 44.6'	738	520	4012
CTD	34E 17.73'	120E 37.47'	515	505	4013
CTD	34E 24.96'	120E 29.62'	100	90	4014

## NIGHT: TRAWL &amp; CTD - SAN MIGUEL

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	34E 26.59'	120E 12.68'	73	63	421
trawl	34E 26.59'	120E 12.68'	73	85	421
trawl	34E 18.9'	120E 20.45'	355	85	422
CTD	34E 18.9'	120E 20.45'	355	345	422
CTD	34E 10.6'	120E 28.3'	149	140	423
trawl	34E 10.6'	120E 28.3'	149	140	423
trawl	34E 04.2'	120E 34.7'	159	85	424
CTD	34E 04.2'	120E 34.7'	159	150	424
trawl	33E 55.1'	120E 42.7'	1848	85	425
CTD	33E 55.1'	120E 42.7'	1848	520	425

## DAY: CTD - VANDENBERG

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	34E 26.8'	120E 44.3'	493	483	4015
CTD	34E 26.8'	120E 57'	900	520	4016
CTD	34E 26.8'	121E 09'	1413	520	4017
CTD	34E 26.8'	121E 21.25'	2148	520	4018
CTD	34E 47.1'	121E 21.25'	482	470	4019
CTD	34E 47.1'	121E 08.9'	566	520	4020
CTD	34E 47.1'	120E 56.58'	304	294	4021
CTD	34E 47.1'	120E 44.48'	77	70	4022

## NIGHT: TRAWL &amp; CTD - VANDENBERG

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	34E 37'	120E 42.5'	60	50	431
trawl	34E 37'	120E 42.5'	60	85	431
trawl	34E 37'	120E 45.75'	92	85	432
CTD	34E 37'	120E 45.75'	92	85	432
CTD	34E 37'	120E 51.75'	308	300	433
trawl	34E 37'	120E 51.75'	308	85	433
trawl	34E 37'	121E 10'	154	85	434
CTD	34E 37'	121E 10'	154	145	434
trawl	34E 37'	121E 25'	1440	85	435
CTD	34E 37'	121E 25'	1440	520	435

## DAY: CTD - PIEDRAS BLANCAS

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	35E 32.12'	121E 21.8'	516	506	4023
CTD	35E 32.12'	121E 34.1'	848	520	4024
CTD	35E 32.12'	121E 46.3'	1007	520	4025
CTD	35E 32.12'	121E 58.8'	1258	520	4026
CTD	35E 52'	121E 58.8'	1353	520	4027
CTD	35E 52'	121E 46.4'	968	520	4028
CTD	35E 52'	121E 34'	510	500	4029

## NIGHT: TRAWL &amp; CTD - PIERAS BLANCAS

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	35E 42.2'	121E 21.8'	60	50	441
trawl	35E 42.2'	121E 21.8'	60	85	441
trawl	35E 42.2'	121E 25.75'	167	85	442
CTD	35E 42.2'	121E 25.75'	167	85	442
CTD	35E 42.2'	121E 30.5'	557	520	443
trawl	35E 42.2'	121E 30.5'	557	85	443
trawl	35E 42.2'	121E 42'	1011	85	444

CTD	35E 42.2'	121E 42'	1011	520	444
trawl	35E 42.2'	121E 52'	1711	85	445
CTD	35E 42.2'	122E 52'	1711	520	445

NIGHT: TRAWL & CTD - MONTEREY BAY INSIDE

OPS	Latitude	Longitude	Depth(m)	Wire(m)	Station	Strata
CTD	36E 50.8'	121E 59'	91	81	119	
trawl	36E 50.8'	121E 59'	91	85	119	MI
trawl	36E 46'	121E 52'	73	85	114	MI
CTD	36E 46'	121E 52'	73	63	114	
CTD	36E 44.4'	121E 58.6'	238	228	116	
trawl	36E 44.4'	121E 58.6'	238	85	116	MI
trawl	36E 42.5'	121E 54.5	91	85	115	MI
CTD	36E 42.5'	121E 54.5	91	81	115	
CTD	36E 38.5'	121E 51.5'	37	30	111	
trawl	36E 38.5'	121E 51.5'	37	25	111	MI
trawl	36E 39.3'	121E 56.8'	73	85	112	MI
CTD	36E 39.3'	121E 56.8'	73	63	112	

DAY: CTD - MONTEREY BAY OUTSIDE

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36E 40'	122E 10'	1134	520	1002
CTD	36E 46.3'	122E 16.1'	823	520	1003
CTD	36E 46.3'	122E 28.4'	2100	520	1004
CTD	36E 40'	122E 22.3'	1737	520	1005
CTD	36E 33.7'	122E 16.2'	2560	520	1006
CTD	36E 33.7'	122E 28.4'	2743	520	1007
CTD	36E 40'	122E 34.6'	2377	520	1008
CTD	36E 46.3'	122E 40.7'	2148	520	1009
CTD	36E 33.7'	122E 40.7'	2740	520	1010

NIGHT: TRAWL & CTD - MONTEREY BAY OUTSIDE

OPS	Latitude	Longitude	Depth(m)	Wire(m)	Station	Strata
CTD	36E 35'	122E 10.5'	2322	520	110	
trawl	36E 35'	122E 10.5'	2322	25	110	MO
trawl	36E 35'	122E 10.5'	2322	85	110	MO
trawl	36E 35'	122E 10.5'	2322	215	110	MO
CTD	36E 35'	122E 2'	530	510	109	
trawl	36E 35'	122E 2'	530	85	109	MO
trawl	36E 38.8'	122E 3'	914	85	113	MO
CTD	36E 38.8'	122E 3'	914	520	113	
CTD	36E 42'	122E 6.5'	1920	520	117	
trawl	36E 42'	122E 6.5'	1920	85	117	MO

trawl	36E 46.4'	122E 9'	914	85	118	MO
CTD	36E 46.4'	122E 9'	914	520	118	

DAY: CTD - DAVENPORT

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	36° 52.6'	122° 10'	91	81	1011
CTD	36° 52.6'	122° 22.3'	823	520	1012
CTD	36° 52.6'	122° 34.6'	1600	520	1013
CTD	36° 52.6'	122° 47'	2286	520	1014
CTD	36° 52.6'	122° 59.3'	2697	520	1015
CTD	36° 59'	122° 53'	1372	520	1016
CTD	37° 5'	122° 47'	686	520	1017
CTD	37° 5'	122° 34.6'	119	110	1018
CTD	37° 5'	122° 22.3'	59	50	1019

NIGHT: TRAWL & CTD - DAVENPORT

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire(m)</i>	<i>Station</i>	<i>Strata</i>
CTD	36E 59'	122E 17.5'	82	72	123	
trawl	36E 59'	122E 17.5'	82	85	123	SS
trawl	36E 59'	122E 22.5'	128	85	124	DS
CTD	36E 59'	122E 22.5'	128	118	124	
CTD	36E 59'	122E 25.5'	457	445	125	
trawl	36E 59'	122E 25.5'	457	85	125	DS
CTD	36E 59'	122E 35.5'	402	390	126	
trawl	36E 59'	122E 35.5'	402	85	126	DS
trawl	36E 59'	122E 45.5'	1085	85	127	DS
CTD	36E 59'	122E 45.5'	1085	520	127	

DAY: CTD - PESCADERO

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	37E 10.7'	122E 28.4'	68	58	1020
CTD	37E 10.7'	122E 40.7'	110	100	1021
CTD	37E 10.7'	122E 53'	420	410	1022
CTD	37E 10.7'	123E 5.3'	870	520	1023
CTD	37E 16.5'	123E 11.4'	1190	520	1024
CTD	37E 22.3'	123E 5.3'	823	520	1025
CTD	37E 22.3'	122E 53'	200	190	1026
CTD	37E 22.3'	122E 40.7'	88	78	1027
CTD	37E 22.3'	122E 28.4'	27	20	1028

NIGHT: TRAWL & CTD - PESCADERO

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire(m)</i>	<i>Station</i>	<i>Strata</i>
CTD	37E 16.5'	122E 34'	82	75	131	

trawl	37E 16.5'	122E 34'	82	85	131	SS
trawl	37E 16.5'	122E 39'	95	85	132	SS
CTD	37E 16.5'	122E 39'	95	85	132	
CTD	37E 16.5'	122E 49'	165	155	133	
trawl	37E 16.5'	122E 49'	165	85	133	DS
CTD	37E 16.5'	122E 59'	550	520	134	
trawl	37E 16.5'	122E 59'	550	85	134	DS
trawl	37E 16.5'	123E 09'	1006	85	135	DS
CTD	37E 16.5'	123E 09'	1006	520	135	

DAY: CTD - OUTSIDE FARALLON ISLANDS

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	37° 30.8'	122° 59.3'	230	220	1029
CTD	37° 30.8'	123° 11.6'	1280	520	1030
CTD	37° 30.8'	123° 24'	2377	520	1031
CTD	37° 30.8'	123° 36.3'	2652	520	1032
CTD	37° 38.4'	123° 36.3'	3338	520	1033
CTD	37° 46.2'	123° 36.3'	2700	520	1034
CTD	37° 46.2'	123° 24'	1510	520	1035
CTD	37° 46.2'	123° 11.6'	128	118	1036

NIGHT: TRAWL & CTD - OUTSIDE FARALLON ISLANDS

OPS	Latitude	Longitude	Depth(m)	Wire(m)	Station	Strata
CTD	37E 39.5'	123E 2.5'	120	110	152	
trawl	37E 39.5'	123E 2.5'	120	85	152	DN
trawl	37E 39.5'	123E 12.5'	1245	85	154	DN
CTD	37E 39.5'	123E 12.5'	1245	520	154	
CTD	37E 44.6'	123E 8.3'	91	81	156	
trawl	37E 44.6'	123E 8.3'	91	85	156	SN
CTD	37E 53'	123E 19'	91	81	160	
trawl	37E 53'	123E 19'	91	85	160	SN
trawl	37E 53'	123E 30'	1463	85	162	DN
CTD	37E 53'	123E 30'	1463	520	162	

DAY: CTD - PT. REYES

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38E 1.6'	123E 17.8'	120	110	1045
CTD	38E 1.6'	123E 5.5'	64	54	1046
CTD	38E 1.6'	123E 30.1'	137	127	1037
CTD	38E 1.6'	123E 42.4'	2560	520	1038
CTD	38E 1.6'	123E 54.7'	3475	520	1039
CTD	38E 18.5'	123E 42.4'	1463	520	1042
CTD	38E 18.5'	123E 30.1'	275	265	1043
CTD	38E 18.5'	123E 17.8'	110	100	1044

NIGHT: TRAWL & CTD - PT. REYES

OPS	Latitude	Longitude	Depth(m)	Wire(m)	Station	Strata
CTD	38E 10'	123E 29'	285	275	171	

trawl	38E 10'	123E 29'	285	85	171	DN
trawl	38E 10'	123E 22'	183	85	170	DN
CTD	38E 10'	123E 22'	183	173	170	
CTD	38E 10'	123E 17'	128	118	168	
trawl	38E 10'	123E 17'	128	85	168	DN
trawl	38E 10'	123E 10'	91	85	167	SN
CTD	38E 10'	123E 10'	91	81	167	
CTD	38E 9.5'	123E 5'	73	63	166	
trawl	38E 9.5'	123E 5'	73	85	166	SN
trawl	38E 10'	123E 0'	55	25	165	SN
CTD	38E 10'	123E 0'	55	45	165	

DAY: CTD - FORT ROSS

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38E 10'	124E 07'	3658	520	1040
CTD	38E 18.5'	123E 54.7'	2835	520	1041
CTD	38E 18.5'	124E 07.7'	3600	520	4030
CTD	38E 28'	124E 14.7'	3500	520	4031
CTD	38E 37.85'	124E 07.7'	1413	520	4032
CTD	38E 37.85'	123E 56'	1805	520	4033
CTD	38E 37.85'	123E 43.3'	245	235	4034
CTD	38E 37.85'	123E 30.25'	98	88	4035

NIGHT: TRAWL & CTD - FORT ROSS

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38E 28'	123E 14'	60	50	451
trawl	38E 28'	123E 14'	60	85	451
trawl	38E 28'	123E 18.5'	92	85	452
CTD	38E 28'	123E 18.5'	92	82	452
CTD	38E 28'	123E 23.2'	115	105	453
trawl	38E 28'	123E 23.2'	115	85	453
trawl	38E 28'	123E 42.6'	910	85	454
CTD	38E 28'	123E 42.6'	910	520	454
trawl	38E 28'	124E 05'	3350	85	455
CTD	38E 28'	124E 05'	3350	520	455

DAY: CTD - NAVARRO

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38E 58'	123E 47'	72	62	4036
CTD	38E 58'	123E 59.8'	500	490	4037
CTD	38E 58'	124E 12.8'	2000	520	4038
CTD	38E 58'	124E 25.6'	3500	520	4039
CTD	39E 08'	124E 28'	3200	520	4040
CTD	39E 18	124E 25.6'	2200	520	4041
CTD	39E 18'	124E 12.8'	1200	520	4042
CTD	39E 18'	123E 59.8'	400	390	4043

CTD	39E 18'	123E 50.5'	85	75	4044
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NIGHT: TRAWL & CTD - NAVARRO

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	39E 08'	123E 45.75'	50	40	461
trawl	39E 08'	123E 45.75'	50	85	461
trawl	39E 08'	123E 51'	100	85	462
CTD	39E 08'	123E 51'	100	90	462
CTD	39E 08'	124E 00'	500	490	463
trawl	39E 08'	124E 00'	500	85	463
trawl	39E 08'	124E 19'	2000	85	464
CTD	39E 08'	124E 19'	2000	520	464
trawl	39E 08'	124E 37'	3300	85	465
CTD	39E 08'	124E 37'	3300	520	465

DAY: CTD - DELGADA

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	39E 40'	123E 50'	60	50	4045
CTD	39E 40'	124E 03'	600	520	4046
CTD	39E 40'	124E 16'	1400	520	4047
CTD	39E 40'	124E 29'	2100	520	4048
CTD	39E 50'	124E 34.5'	1300	520	4049
CTD	40E 00	124E 42.25'	1000	520	4050
CTD	40E 00'	124E 29'	1000	520	4051
CTD	40E 00'	124E 16'	900	520	4052
CTD	40E 00'	124E 06'	45	35	4053

NIGHT: TRAWL & CTD - DELGADA

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	39E 50'	123E 55'	60	50	471
trawl	39E 50'	123E 55'	60	85	471
trawl	39E 50'	123E 58.8'	120	85	472
CTD	39E 50'	123E 58.8'	120	110	472
CTD	39E 50'	124E 06.5'	300	290	473
trawl	39E 50'	124E 06.5'	300	85	473
trawl	39E 50'	124E 24'	1500	85	474
CTD	39E 50'	124E 24'	1500	520	474
trawl	39E 50'	124E 45'	1300	85	475
CTD	39E 50'	124E 45'	1300	520	475

NIGHT: TRAWL & CTD - GULF OF THE FARALLONES

<i>OPS</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth(m)</i>	<i>Wire Out(m)</i>	<i>Station</i>
CTD	37E 47.5'	122E 52'	55	45	139
trawl	37E 47.5'	122E 52'	55	25	139
trawl	37E 42'	122E 54.5'	55	25	138

CTD	37E 42'	122E 54.5'	55	45	138
CTD	37E 35.8'	122E 49.9'	55	45	237
trawl	37E 35.8'	122E 49.9'	55	25	237

**Trawl Transect Schedule and Import Dates: (Tentative)**

<b>LEG 1 ~ TRANSECTS</b>					
MAY 1	SAN DIEGO				
MAY 2	SAN CLEMENTE				
MAY 3	SAN NICOLAS				
MAY 4	SAN MIGUEL				
MAY 5	VANDENBERG				
MAY 6	PIEDRAS BLANCAS				
<b>LEG 2 ~ TRANSECTS</b>					
MAY 7	MONTEREY BAY INSIDE, AFTER SKIFF EXCHANGE AT SANTA CRUZ HARBOR				
MAY 8	MONTEREY BAY OUTSIDE				
MAY 9	DAVENPORT				
MAY 10	PESCADERO				
MAY 11	INSIDE GULF OF FARALLONES				
MAY 12	OUTSIDE FARALLON ISLANDS				
MAY 13	POINT REYES				
<b>LEG 3 ~ TRANSECTS</b>					
MAY 14	FORT ROSS, AFTER SKIFF EXCHANGE AT BODEGA BAY				
MAY 15	NAVARRO				
MAY 16	DELGADA				
MAY 17	DELGADA				
MAY 18	NAVARRO				
MAY 19	FORT ROSS				
MAY 20	PT. REYES				
MAY 21	OUTSIDE FARALLON ISLANDS				
MAY 22	COMPLETE NIGHT TRAWLS IN AM, THEN IMPORT TO SAN FRANCISCO				
MAY 23	FULL DAY IMPORT SAN FRANCISCO				
MAY 24	FULL DAY IMPORT SAN FRANCISCO				
<b>LEG 4 ~ TRANSECTS</b>					
MAY 25	INSIDE GULF OF FARALLONES, AFTER DEPARTURE FROM SAN FRANCISCO				
MAY 26	PESCADERO				
MAY 27	DAVENPORT				
MAY 28	MONTEREY BAY OUTSIDE				

MAY 29 MONTEREY BAY INSIDE  
MAY 30 KRILL ACOUSTICS & NET LINER MENSURATION  
MAY 31 KRILL ACOUSTICS & NET LINER MENSURATION  
**LEG 5 ~ TRANSECTS**  
JUNE 1 PIEDRAS BLANCAS, AFTER SKIFF EXCHANGE AT SANTA CRUZ HARBOR  
JUNE 2 VANDENBERG  
JUNE 3 SAN MIGUEL  
JUNE 4 SAN NICOLAS  
JUNE 5 SAN CLEMENTE  
JUNE 6 SAN DIEGO  
**LEG 6 ~ TRANSECTS**  
JUNE 7 TRANSIT NORTH  
JUNE 8 MONTEREY BAY OUTSIDE, AFTER SKIFF EXCHANGE AT MONTEREY HARBOR  
JUNE 9 DAVENPORT  
JUNE 10 PESCADERO  
JUNE 11 OUTSIDE FARALLON ISLANDS  
JUNE 12 INPORT TO SAN FRANCISCO, END OF DS-05-04

**Map of Mid-Water Trawling Transects for DS-05-04**

Each T Represents a Mid-Water Trawl Station  
Each o Represents a Daytime CTD Station

